इंटरनेट मानक

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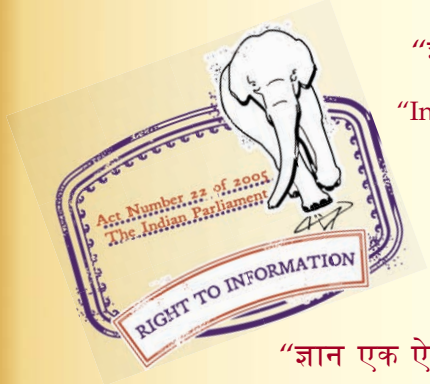
"जानने का अधिकार, जीने का अधिकार"
Mazdoor Kisan Shakti Sangathan
"The Right to Information, The Right to Live"

"पुराने को छोड नये के तरफ"
Jawaharlal Nehru
"Step Out From the Old to the New"

IS 12445 (1988): Molybdenum plate, sheet, strip and foil [MTD 9: Lead, Zinc, Cadmium, Tin, Antimony and their Alloys]



"ज्ञान से एक नये भारत का निर्माण"
Satyanarayan Gangaram Pitroda
"Invent a New India Using Knowledge"

"ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है"
Bhartṛhari—Nītiśatakam
"Knowledge is such a treasure which cannot be stolen"

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(Reaffirmed 1999)

Indian Standard

SPECIFICATION FOR MOLYBDENUM PLATE, SHEET, STRIP AND FOIL

[Ref : Doc : SMDC 33 (3076)]
Special Alloys Sectional Committee, SMDC 33; Panel for Molybdenum Products, SMDC 33/P-6

1. Scope — This standard covers the requirements of unalloyed molybdenum plate, sheet, strip and foil for applications in discharge lamps, electron tubes, semiconductors, electrical contacts, high temperature furnaces, chemical processing equipment, etc.

2. Supply of Material — The general requirements relating to the supply of material shall conform to IS : 1387-1967 'General requirements for the supply of metallurgical materials (*first revision*)'.

3. Chemical Composition — The chemical composition of molybdenum sheet when determined gravimetrically, spectrometrically or by any other standard test method shall be as given in Table 1.

TABLE 1 CHEMICAL COMPOSITION

Element	Requirement, Percent
Carbon, *Max*	0·010
Oxygen, *Max*	0·007
Nitrogen, *Max*	0·002
Iron, *Max*	0·015
Nickel, *Max*	0·005
Molybdenum, *Min*	99·90

4. Finish — The molybdenum plate, sheet, strip and foil shall be supplied in the following finishes:

a) Finish 1 : As rolled,
b) Finish 2 : Chemically cleaned,
c) Finish 3 : Annealed, and
d) Finish 4 : Ground for plates only.

5. Freedom from Defects — The plate, sheet, strip and foil shall be free from defects such as fissures, cracks, peeling, wrinkles, distortion, roughness, etc.

6. Requirements — Material supplied according to this specification shall conform to the mechanical properties given in Table 2.

TABLE 2 MECHANICAL PROPERTIES

Temper	Tensile Strength MPa	0·2% Proof Stress, *Min* MPa	Elongation, Percent on GL 50 mm	Bend Test* Radius
Annealed	415 to 585	310	5-10	t
¼ hard	585 to 760	480	4-8	t
½ hard	760 to 930	620	3-5	t
Hard	930 to 1 105	760	2-5	2t

*Applicable for sheet thickness 1·65 mm and under only when tested in accordance with IS : 1599-1985 'Method for bend test (*second revision*)'.

Adopted 24 June 1988 Gr 2

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

6.1 Erichsen value for sheets are given in Table 3 for guidance only.

TABLE 3 ERICHSEN VALUE

Thickness mm	Erichsen Value, *Min*
0·1 to 0·15 excl	2·7
0·15 to 0·2 excl	3·4
0·2 to 0·25 excl	3·7
0·25 to 0·3 excl	4·0
0·3 to 0·4 excl	4·5
0·4 to 0·5 excl	4·8
0·5 to 0·6 excl	5·1
0·6 to 0·7 excl	5·2

6.2 *Flatness* — The flatness of sheets not less than 0·5 mm in thickness shall be not more than 4 percent and that of the sheets less than 0·5 mm in thickness shall be not more than 5 percent.

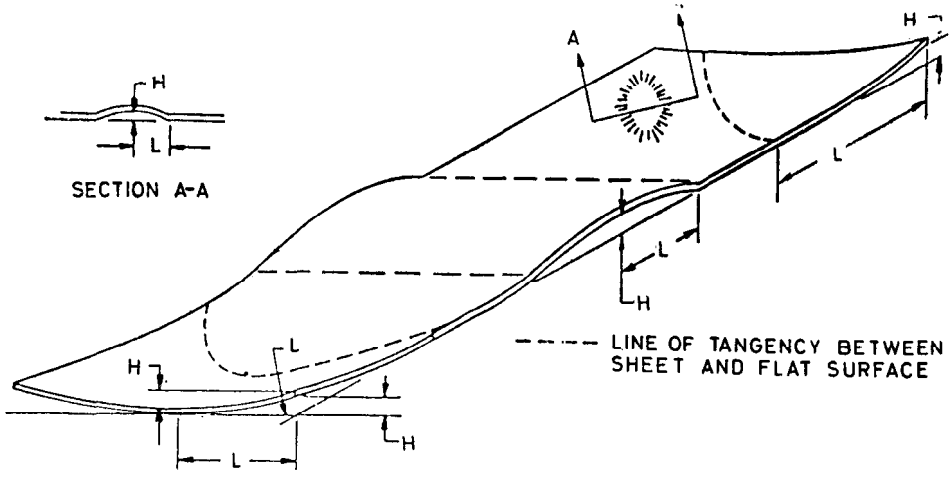
The flatness deviation (percent) shall be expressed by $H/L \times 100$

where

H = the maximum gap between the bottom surface of sheet and the flat surface, and

L = the minimum distance between the highest point on the sheet and the point of contact with the flat surface.

6.2.1 The method for measuring flatness is illustrated in Fig. 1.



All dimensions in millimetres.

FIG. 1 METHOD FOR MEASURING FLATNESS

7. Dimensions and Dimensional Tolerances

7.1 *Tolerances on Thickness* — The tolerances on thickness of the sheets shall be as given in Table 4.

7.2 *Tolerances on Width* — The tolerances on width shall be as agreed to between the purchaser and the manufacturer.

8. Basis of Ordering — Molybdenum sheets ordered against this specification shall include the following data:

i) Description,
ii) Finish and Temper,
iii) Dimensions,
iv) Quantity,
v) Packing and Marking, and
vi) Number of this Indian Standard.

TABLE 4 TOLERANCES ON THICKNESS

(*Clause* 7.1)

Thickness mm	Tolerances, mm	
	For Width of Sheet *Less than 200*	For Width of Sheet *200 or More*
Under 0·05	± 0·005	—
0·05 to 0·15 excl	± 0·020	± 0·03
0·15 to 0·3 excl	± 0·025	± 0·04
0·3 to 0·5 excl	± 0·030	± 0·05
0·5 to 0·7 excl	± 0·035	± 0·06
0·7 to 0·8 excl	± 0·040	± 0·07
0·8 to 0·9 excl	± 0·050	± 0·08
0·9 to 1·0 excl	± 0·060	± 0·09
1·0 to 1·5 excl	± 0·080	± 0·10
1·5 to 2·5 excl	± 0·100	± 0·20
2·5 to 3·0 excl	± 0·150	± 0·30
3·0 to 5·0 excl	± 0·300	± 0·50

Note — The tolerances on thickness other than the range specified shall be determined upon an agreement between the purchaser and the manufacturer.

9. Packaging — The molybdenum strips and foils shall be suitably packed in wooden cases after being covered in polyethylene sheet, molybdenum plates and sheets shall be suitably interlined with polyethylene sheet.

10. Marking

10.1 The sheets shall be marked with the following:

a) Name of the manufacturer,
b) Date of manufacture,
c) Dimensions,
d) Mass and number of sheets, and
e) Lot number.

10.2 The packages shall be marked as follows:

a) Name of the manufacturer,
b) Name and address of the consigner,
c) Gross weight, and
d) Delivery challan number.

10.3 *Standard Marking* — Details available with the Bureau of Indian Standards.

EXPLANATORY NOTE

Molybdenum is one of the naturally occurring element having a body centred cubic crystal lattice. It is a refractory metal having a high melting point of 2 610°C with a density 10·14 g/cc, *Min.* This metal is characterized by low thermal expansion, good thermal conductivity and low electrical resistance. Molybdenum sheets are produced by powder metallurgy techniques. Molybdenum finds wide application in discharge lamps, electron tubes, semi-conductors, electrical contacts, high temperature furnaces and chemical processing equipment, etc.

This standard has been prepared as a guide to the manufacturers and the users of molybdenum sheets for obtaining desired characteristics. In the preparation of this standard, necessary assistance has been derived from

JIS H 4483-1984 Molybdenum sheets for lighting and electronic equipments.

ASTM B 386-1985 (MO 361) Molybdenum and molybdenum alloy plate, sheet, strip and foil.

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